REMARKS

Claims 1-21 and 23 are present in the application. In view of the remarks that follow, Applicants respectfully request reconsideration of the application. In this regard, the following remarks reply to new comments presented by the Examiner in the current Office Action.

Independent Claim 1 - Sakaguchi and Henley

Independent Claim 1 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sakaguchi U.S. Patent No. 6,221,738 and Henley U.S. Patent No. 6,013,563. This ground of rejection is respectfully traversed. In this regard, the PTO recognizes in MPEP §2142 that:

> The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that the teachings drawn from Sakaguchi and Henley fail to establish a prima facia case of obviousness under §103 with respect to Claim 1, for the mutually exclusive reasons that are discussed below.

SAKAGUCHI DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

The limitations of independent Claim 1 include a recitation of:

> providing a first wafer with a surface comprising of a first semiconductor layer of a first natural lattice constant;
>
> forming a second semiconductor layer with a second

> natural lattice constant on the first semiconductor layer, with a strain gradient introduced at the interface of said second semiconductor layer and said first semiconductor layer; . . . and
>
> performing a water jet cleaving procedure at said strain gradient so that said second semiconductor layer is separated from said first semiconductor layer and said first wafer.

The present Office Action relies on the embodiment of Figures 4A-4D of Sakaguchi, and asserts that two layers 102 and 103 thereof have different lattice constants that inherently produce a strain gradient, such that separation can be effected by introducing an external force at the strain gradient. In more detail, at lines 15-20 on page 2 and lines 4-6 on page 3, the Office Action refers to lines 1-3 in column 14 of Sakaguchi, and asserts that Sakaguchi discloses the use of an external force at a strain gradient to cleave two portions of a device. However, this is not what is taught by the indicated portion of Sakaguchi. More specifically, the indicated portion of Sakaguchi states (at the top of column 14) that:

> . . . as shown in FIG. 4D, the bonded substrate members 101 and 106 are separated by the application of an external force or by the generation of an internal pressure, whereby the substrate members are mutually divided by the interface between the second porous layer 103 and the non-porous layer 102', which is different from the bonding interface. In this operation, a part of the second porous layer 103 in the vicinity of such a separating interface may be broken and lost. (Emphasis added)

In other words, the Office Action is relying on a portion of Sakaguchi that does not teach separation due to a strain caused by differing lattice constants. Instead, Sakaguchi teaches a

different approach that involves the provision of a layer made of a porous material, and the application of a force to the porous layer in order to effect a separation, where the porous layer may actually be destroyed as it effects the separation. In the Office Action, the Examiner asserts that Applicants are wrong on this point. In support of this assertion, at the top of page 9 of the Office Action, the Examiner quotes the following passage from lines 12-15 in column 9 of Sakaguchi:

> The interface can be made weaker by the difference in the lattice constant and the introduction of defects, and the separation can be achieved at such interface.

However, this quoted passage does not actually support the Examiner's position, because it is not discussing the embodiment of Sakaguchi on which the §103 rejection is based (Figures 4A-4D), and because it has been taken out of context. To put this passage in context, consider the following longer passage from the same location in Sakaguchi (which includes the passage quoted by the Examiner):

> It is already known that, due to a difference in a lattice constant caused by using different materials in heteroepitaxy, defects are introduced into an interface between the different materials or into an epitaxial layer. . . . The interface can be made weaker by the difference in the lattice constant and the introduction of defects, and the separation can be achieved at such interface.
>
> On the other hand, the separation layer can be formed without the use of heteroepitaxy. As an example, a porous material is used. (Emphasis added).

In other words, although Sakaguchi does discuss separation through the use of heteroepitaxy with differing lattice constants, Sakaguchi then immediately states that his invention is different, in that it achieves separation using "a porous material" and "without the use of heteroepitaxy". Thus, the indicated portions of Sakaguchi do not teach what the Office Action says they do, but instead teach separation due to the presence of a layer with a high porosity.

In lines 7-15 on page 9, the Office Action asserts that Applicants have previously argued there is no strain gradient, that this is merely an argument of counsel, and that Applicants should submit evidence on this point. However, it is respectfully submitted that the Examiner has missed Applicants' point. As discussed above, MPEP §2142 states that:

> The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

What Applicants previously argued is that the Examiner has failed to carry the burden of establishing a prima facie case of obviousness. In this regard, and as discussed above, the §103 rejection is based on an embodiment of Sakaguchi that achieves separation through the use of a porous layer, and Sakaguchi expressly states that separation is achieved with that porous layer and not through use of heteroepitaxy with differing lattice constants. Consequently, the Examiner has failed to show that separation is in any way due to differing lattice constants in the embodiment on which the §103 rejection is based (Figures 4A-4D). Applicants thus correctly pointed out that the Examiner has failed to carry the burden of establishing a prima facie case of obviousness. Consequently, as pointed out in MPEP §2142, "If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness". Since Applicants have properly argued that the burden of proof here is still on the Examiner,

Applicants do not have the burden of submitting any evidence, much less evidence of the type of discussed in the Office Action.

As discussed above, the indicated portions of Sakaguchi do not teach what the Office Action says they do. In particular, they very clearly teach separation due to the presence of a layer with a high porosity, and not due to heteroepitaxy and differing lattice constants. Accordingly, it is respectfully submitted that Sakaguchi fails to fulfill its intended role in the §103 rejection, and that the §103 rejection is therefore defective. For this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by the proposed combination of Sakaguchi and Henley.

PTO CANNOT ESTABLISH OBVIOUSNESS WITH ART THAT TEACHES AWAY

In evaluating obviousness, it is not proper to selectively consider only part of a reference, while ignoring other parts that teach away from the invention. In this regard, the provisions of MPEP §2141.02 specify that:

> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (Emphasis in original).

In the present situation, and as noted above, the Office Action relies on the embodiment of Figures 4A-4D of Sakaguchi, and asserts that two layers 102 and 103 thereof have different lattice constants that inherently produce a strain gradient, such that separation can be effected by introducing an external force at the strain gradient. However, as noted above, Sakaguchi actually teaches a different approach that involves the provision of a layer made of a porous material, and the application of a force to the porous layer in order to effect a separation. The basic message of Sakaguchi is that this "porosity" approach is superior to the use of differing lattice constants. For

example, Sakaguchi states at lines 55-61 of column 11 that Sakaguchi's porosity approach is superior because it:

> . . . allows the transfer of an Si layer of excellent crystallinity or a non-porous single-crystal compound semiconductor layer onto the insulating surface of an economically excellent substrate having a large area, while sufficiently suppressing cracks resulting from a difference in lattice constant or in thermal expansion coefficient, which is a problem encountered by conventional methods . . . .

Sakaguchi thus teaches directly away from the use of lattice constants, in favor of the porosity approach. As noted above, the Office Action relies on a portion of Sakaguchi that utilizes this porosity approach to effect separation. In particular, the Office Action relies on the portion of Sakaguchi at the top of column 14, which states that:

> . . . as shown in FIG. 4D, the bonded substrate members 101 and 106 are separated by the application of an external force or by the generation of an internal pressure, whereby the substrate members are mutually divided by the interface between the second porous layer 103 and the non-porous layer 102', which is different from the bonding interface. In this operation, a part of the second porous layer 103 in the vicinity of such a separating interface may be broken and lost. (Emphasis added)

The Office Action also quotes a sentence from lines 12-15 in column 9, where Sakaguchi states that:

> The interface can be made weaker by the difference in the lattice constant and the introduction of defects, and the separation can be achieved at such interface.

However, this quoted passage does not actually support the Examiner's position, because it is not discussing the embodiment of Sakaguchi on which the §103 rejection is based (Figures 4A-4D). In fact, it is immediately followed by a statement that, in Sakaguchi's invention:

> . . . the separation layer can be formed without the use of heteroepitaxy. As an example, a porous material is used.

Thus, the Office Action is relying on portions of Sakaguchi that do not teach separation due to a strain caused by heteroepitaxy and differing lattice constants, but that instead teach separation due to the presence of a layer with a high porosity. In fact, as discussed above, Sakaguchi expressly teaches away from the use of differing lattice constants. The §103 rejection also relies on the Henley patent, but does not assert that Henley has any relevant teachings regarding lattice constants. It does not appear that Henley even mentions "lattice constants". Consequently, Sakaguchi teaches directly away from Applicants' invention, and Henley contains nothing at all on this particular point.

Since it is well recognized that teaching away from the claimed invention is a per se demonstration of lack of prima facie obviousness, it is respectfully submitted that Sakaguchi and Henley do not factually support a prima facie case of obviousness with respect to Claim 1. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Sakaguchi and Henley.

THE COMBINATION OF REFERENCES IS IMPROPER

There is yet another reason why the teachings drawn from Sakaguchi and Henley cannot properly be combined under §103 to reject Claim 1. In this regard, MPEP §2142 provides that:

> To reach a proper determination under §103, the examiner must *step* backward in time and *into* the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. . . . Knowledge of applicant's disclosure must be put aside in reaching this determination, . . . impermissible hindsight must be avoided, and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

In addition, MPEP §2143.01 provides that:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.
> (Emphasis in original).

Here, there would be no motivation for a person of ordinary skill in the art to combine Sakaguchi and Henley in the proposed manner, because Henley has no teachings at all that would suggest the use of differing lattice constants to facilitate a separation of two layers, and Sakaguchi teaches directly away from the use of differing lattice constants, in favor of a significantly different approach that involves use of a porous layer. In fact, since Sakaguchi teaches away from the use of lattice constants, Sakaguchi would motivate a person not to use lattice constants when attempting to combine teachings from Sakaguchi and Henley. Therefore, the §103

rejection of Claim 1 is not complete, because it does not properly establish the required motivation for making the proposed combination of Sakaguchi and Henley, so as to use lattice constants even though Sakaguchi teaches not to do so. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 in view of Sakaguchi and Henley.

In view of the various different reasons discussed above, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by Sakaguchi and Henley. Claim 1 is thus believed to be allowable over Sakaguchi and Henley, and notice to that effect is respectfully requested.

Independent Claim 1 - Godbey and Henley

Independent Claim 1 further stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Godbey U.S. Patent No. 5,013,681 and the Henley patent. This ground of rejection is respectfully traversed. In this regard, and as mentioned earlier, the PTO recognizes in MPEP §2142 that:

> The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that the teachings drawn from Godbey and Henley fail to establish a prima facia case of obviousness under §103 with respect to Claim 1, for the mutually exclusive reasons that are discussed below.

GODBEY DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

With reference to lines 1-6 and 12-13 on page 4 of the Office Action, the Examiner asserts that Figures 9-12 of Godbey disclose two layers 72 and 74 with different lattice constants

that inherently produce a strain gradient, such that cleaving can be effected by introducing an external force at the strain gradient. However, Godbey does not appear to contain anything teaching or suggesting that an external force is used to cleave two different portions of a device, much less due to a strain gradient between adjacent layers that have different lattice constants. Instead, Godbey teaches that excess material is removed from the device not by cleaving, but by etching and/or grinding/polishing. For example, lines 30-35 in column 4 state that the layer 20 in the embodiment of Figures 1-6 is removed by grinding, chemical polishing, and/or etching. And lines 46-50 in column 5 state that the process steps for the embodiment of Figures 9-12 are the same as for the embodiment of Figures 1-6. In other words, in Figures 9-12, excess material is removed from the device not by cleaving, but by etching and/or grinding/polishing. Thus, Godbey does not actually teach what the Office Action says it does.

Applicants previously pointed out this defect in Godbey. In reply, on pages 9-10 of the Office Action, the Examiner asserts that Applicants are wrong because:

> Godbey is not relied on for teaching the separating of first and second semiconductor layers by cleaving.

However, this assertion is directly contrary to the explanation of the §103 rejection on pages 3-5 of the Office Action, where the Examiner asserts that:

> . . . Godbey et al. teach . . . performing a cleaving procedure so that the second semiconductor 74 is separated from the first semiconductor layer 72 . . . .

Thus, the §103 rejection does in fact rely on Godbey for the teaching of a cleaving process. However, as pointed out by Applicants, Godbey does not actually disclose any cleaving process, and thus does not teach what the Office Action says it does. The statements on page 10 of the

Office Action are directly inconsistent with the §103 rejection, and thus do not support that §103 rejection. In fact, they undermine the §103 rejection.

The Examiner also asserts that Applicants' argument regarding Godbey is not proper because:

> Applicant[s] cannot show nonobviousness by attacking references individually where the rejection is based upon a combination of references.

However, Applicants' argument did not focus on Godbey and ignore Henley. In proposing a combination of Godbey and Henley, the Examiner relied on Godbey to contribute certain teachings to that combination. Applicants' argument points out that Godbey does not disclose what the Office Action says it does, and that the proposed combination of Godbey and Henley therefore fails because the proposed combination of Godbey and Henley necessarily lacks the elements that Godbey fails to disclose. As a result, the §103 rejection is inherently defective. For this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by the proposed combination of Godbey and Henley.

THE PRIOR ART MUST TEACH ALL CLAIM LIMITATIONS UNDER §103

The provisions of MPEP §2142 state that that:

> To establish a *prima facie* case of obviousness, . . . the prior art reference (or references when combined) must teach or suggest all the claim limitations.

As discussed above, neither Godbey nor Henley appears to disclose certain limitations that are expressly recited in Claim 1, including the limitations of Claim 1 that have been quoted above.

Therefore, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Godbey and Henley, because Godbey and Henley do not together "teach or suggest all the claim limitations" (emphasis added), as required by §103 and MPEP §2142. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not obvious under §103 in view of Godbey and Henley.

THE COMBINATION OF REFERENCES IS IMPROPER

There is yet another reason why the teachings drawn from Godbey and Henley cannot properly be combined under §103 to reject Claim 1. In this regard, and as mentioned above, MPEP §2142 provides that:

> To reach a proper determination under §103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. . . . Knowledge of applicant's disclosure must be put aside in reaching this determination, . . . impermissible hindsight must be avoided, and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

In addition, MPEP §2143.01 provides that:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.
> (Emphasis in original).

Here, there would be no motivation for a person of ordinary skill in the art to combine Godbey and Henley in the proposed manner, because neither Godbey nor Henley appears to have any teachings at all that would suggest the use of differing lattice constants to facilitate a separation of two layers. Therefore, the §103 rejection of Claim 1 is incomplete, because it does not properly establish the required motivation for combining Godbey and Henley in the proposed manner. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 in view of Godbey and Henley, and notice to that effect is respectfully requested.

In view of the various different reasons discussed above, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by Godbey and Henley. Claim 1 is thus believed to be allowable over Godbey and Henley, and notice to that effect is respectfully requested.

Independent Claim 11

Independent Claim 11 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sharma U.S. Patent No. 5,344,524 and the Henley patent. This ground of rejection is respectfully traversed. In this regard, the PTO recognizes in MPEP §2142 that:

> The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

Applicants respectfully submit that the teachings drawn from Sharma and Henley fail to establish a prima facia case of obviousness under §103 with respect to Claim 11, for the mutually exclusive reasons that are discussed below.

SHARMA DOES NOT TEACH WHAT THE OFFICE ACTION SAYS IT DOES

The limitations of Claim 11 include a recitation of:

> providing a first wafer with a surface comprising of a first semiconductor material of a first *natural* lattice constant;
>
> forming a second semiconductor layer with a second natural lattice constant on the first semiconductor material so that said second semiconductor layer is strained, and with a large strain gradient formed at the interface of said second semiconductor layer and said first semiconductor material; . . .
>
> performing a compressed air or pressurized fluid cleaving procedure at said strain gradient so that said second semiconductor layer is separated from said first semiconductor material . . . .

With reference to lines 1-7 and 13-15 on page 6, the Office Action asserts that Figure 5 of Sharma discloses two layers 21 and 23 that have different lattice constants, and that therefore inherently have a strain gradient between them, such that cleaving is effected by introducing an external force at the strain gradient. However, this is not what Sharma teaches. More specifically, Sharma does not appear to contain anything teaching or suggesting that an external force is used to cleave two different portions of a device, much less due to adjacent layers that have different lattice constants. Instead, Figure 5 makes it very clear that excess material is removed from the device not by cleaving, but instead by etching and/or grinding/polishing. (For example, see the label "Grinding/Selective Etching" in Figure 5). Thus, Sharma does not actually teach what the Office Action says it does.

Applicants previously pointed out this defect in Sharma. In reply, on pages 10-11 of the Office Action, the Examiner asserts that Applicants are wrong because:

> Sharma is not relied on for teaching the separating of first and second semiconductor layers by cleaving.

However, this assertion is directly contrary to the explanation of the §103 rejection on pages 5-7 of the Office Action, where the Examiner asserts that:

> . . . Sharma et al. teach . . . performing a cleaving procedure so that the second semiconductor layer 21 is separated from the first semiconductor layer 23 . . . .

Thus, the §103 rejection does in fact rely on Sharma for the teaching of a cleaving process. However, as pointed out by Applicants, Sharma does not actually disclose any cleaving process, and thus does not teach what the Office Action says it does. The statements on page 11 of the Office Action are directly inconsistent with the §103 rejection, and thus do not support that §103 rejection. In fact, they undermine the §103 rejection.

The Examiner also asserts that Applicants' argument regarding Sharma is not proper because:

> Applicant[s] cannot show nonobviousness by attacking references individually where the rejection is based upon a combination of references.

However, Applicants' argument did not focus on Sharma and ignore Henley. In proposing a combination of Sharma and Henley, the Examiner relied on Sharma to contribute certain teachings to that combination. Applicants' argument points out that Sharma does not disclose what the Office Action says it does, and that the proposed combination of Sharma and Henley

therefore fails because the proposed combination of Sharma and Henley necessarily lacks the elements that Sharma fails to disclose. As a result, the §103 rejection is inherently defective. For this independent reason alone, it is respectfully submitted that Claim 1 is not rendered obvious under §103 by the proposed combination of Sharma and Henley.

THE PRIOR ART MUST TEACH ALL CLAIM LIMITATIONS UNDER §103

The provisions of MPEP §2142 state that that:

> To establish a *prima facie* case of obviousness, . . . the prior art reference (or references when combined) must teach or suggest all the claim limitations.

As discussed above, neither Sharma nor Henley appears to disclose certain limitations that are expressly recited in Claim 11, including the limitations from Claim 11 that have been quoted above. Accordingly, the §103 rejection fails to establish obviousness because, even when the indicated teachings are combined, they fail to satisfy the requirement that they must collectively "teach or suggest all the claim limitations" (emphasis added), as required by §103 and MPEP §2142. For this independent reason alone, Claim 11 is believed to be patentably distinct from Sharma and Henley, and notice to that effect is respectfully requested.

THE COMBINATION OF REFERENCES IS IMPROPER

There is yet another reason why the teachings drawn from Sharma and Henley cannot properly be combined under §103 to reject Claim 11. In this regard, and as mentioned above, MPEP §2142 provides that:

> To reach a proper determination under §103, the examiner must step backward in time and into the shoes worn by the hypothetical

> "person of ordinary skill in the art" when the invention was unknown and just before it was made. . . . Knowledge of applicant's disclosure must be put aside in reaching this determination, . . . impermissible hindsight must be avoided, and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

In addition, MPEP §2143.01 provides that:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. (Emphasis in original).

Here, there would be no motivation for a person of ordinary skill in the art to combine Sharma and Henley in the proposed manner, because neither Sharma nor Henley appears to have any teachings at all that would suggest the use of differing lattice constants to facilitate a separation of two layers. Therefore, the §103 rejection of Claim 11 is incomplete, because it does not properly establish the required motivation for combining Sharma and Henley in the proposed manner. Accordingly, for this independent reason alone, it is respectfully submitted that Claim 11 is not rendered obvious under §103 in view of Sharma and Henley, and notice to that effect is respectfully requested.

In view of the various different reasons discussed above, it is respectfully submitted that Claim 11 is not rendered obvious under §103 by Sharma and Henley. Claim 11 is thus believed to be allowable over Sharma and Henley, and notice to that effect is respectfully requested.

Independent Claim 20

The limitations of independent Claim 20 include a recitation of:

> providing a first wafer having a first semiconductor layer of a first natural lattice constant;
>
> forming a second semiconductor layer with a second natural lattice constant on the first semiconductor layer, and thereby forming an interface with a large strain gradient; . . . and
>
> directing a pressurized fluid jet at said strain gradient so that said second semiconductor layer is separated from said first semiconductor layer and said first wafer.

Independent Claim 20 stands rejected under 35 USC §103 as obvious in view of a proposed combination of teachings from Sharma and Henley. This ground of rejection is respectfully traversed. The rationale provided in the Office Action for the rejection of Claim 20 is the same rationale provided for the rejection of Claim 11. Therefore, for the same basic reasons discussed above in association with Claim 11, it is respectfully submitted that Claim 20 is not rendered obvious under §103 by Sharma and Henley. Claim 20 is thus believed to be allowable over Sharma and Henley, and notice to that effect is respectfully requested.

Dependent Claims

Claims 2-10, Claims 12-19 and Claims 21 and 23 respectively depend from Claim 1, Claim 11 and Claim 20, and are also believed to be distinct from the art of record, for example for the same reasons discussed above with respect to Claims 1, 11 and 20, respectively.

Conclusion

Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at 972-739-8647.

Although Applicants believe that no fee is due in association with the filing of this Response, the Commissioner is hereby authorized to charge any additional fee required by this paper, or to credit any overpayment, to Deposit Account No. 08-1394 of Haynes and Boone LLP.

Respectfully submitted,

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Enclosures: None

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